

WHAT IS CLAIMED IS:

1. A distance-measuring device comprising:  
two optical systems having a parallax  
therebetween;

5 an image pick up element formed on a semiconductor  
substrate for pick upping two images formed by the  
optical systems;

image processing means formed on the semiconductor  
substrate for processing an image output from the image  
pick up element;

main subject detecting means for detecting a main, 8.4  
subject on the basis of an output from the image  
processing means; and

distance-measuring means for executing a distance  
15 measurement operation, based on the output of the image  
processing means, on the main subject detected by the  
main subject detecting means.

2. The distance-measuring device according to  
claim 1, wherein the image processing means has  
20 a variable image resolution.

3. The distance-measuring device according to  
claim 1, wherein the image processing means can  
individually set an output to the main subject  
detecting means and an output to the distance-measuring  
25 means.

4. A camera including a distance-measuring device 8.9  
comprising:



6. A distance-measuring device comprising:  
a distance-measuring optical system for dividing  
an image of a subject into two images;  
an area sensor formed on a semiconductor substrate  
for pick upping the two images;  
a processing circuit formed on the semiconductor  
substrate for creating outline data on the subject on  
the basis of an output from the area sensor;  
main subject detecting means for detecting a main  
subject from the outline data;  
setting means for setting a distance-measuring  
area for the main subject; and  
distance-measuring means for executing a distance  
measurement operation in the set distance-measuring  
area.

7. A distance-measuring device comprising:  
a distance-measuring optical system for dividing  
an image of a subject into two images;

image pick up sensors formed on a semiconductor  
substrate for pick upping the two images;

a processing circuit formed on the semiconductor  
substrate for summing outputs of the image pick  
up sensors in a predetermined direction into  
one-dimensional data; and

a control circuit for detecting a main subject  
from the one-dimensional data output from the  
processing circuit, and setting a distance-measuring

area for the main subject.

8. A distance-measuring device comprising:

a distance-measuring optical system for dividing  
an image of a subject into two images;

5      photographic sensors formed on a semiconductor  
substrate for pick upping the two images;

a processing circuit formed on the semiconductor  
substrate for summing outputs of the image pick  
up sensors in a predetermined direction into  
10      one-dimensional data;

main subject detecting means for detecting a main  
subject from the one-dimensional data;

setting means for setting a distance-measuring  
area for the main subject; and

15      distance-measuring means for executing a distance  
measurement operation in the set distance-measuring  
area.

9. A distance-measuring device comprising:

20      two optical systems having a parallax  
therebetween;

a photographic element formed on a semiconductor  
substrate for photographing two images formed by the  
optical systems;

25      processing means formed on the semiconductor  
substrate for executing image processing on an output  
from the photographic element; and

distance-measuring means for executing a distance

measurement operation on the basis of the output from the processing means.

10. A distance-measuring device comprising:

two optical systems having a parallax therebetween;

a photographic element formed on a semiconductor substrate for photographing two images formed by the optical systems;

processing means formed on the semiconductor substrate for executing image processing on an output from the photographic element;

main subject detecting means for detecting a main subject on the basis of an output from the processing means; and

distance-measuring means for executing a distance measurement operation on the basis of the output from the processing means and an output from the main subject detecting means.

11. The distance-measuring device according to claim 10, wherein the processing means has a plurality of modes, and can individually set an output for the main subject detecting means and an output for the distance-measuring means.

12. A distance-measuring device comprising:

an AF area sensor formed on a semiconductor substrate for picking up two images formed to have a parallax therebetween, and integrating sensor

data that corresponds to an appropriate amount of light;

a photo reception signal processing circuit formed on the semiconductor substrate for creating outline data based on the sensor data from the AF area sensor;

a control section detecting a main subject in a photography screen on the basis of the outline data output from the photo reception signal processing circuit, and setting, in the photography screen, a distance-measuring area including the main subject; and

a distance-measuring section for executing distance measurement in the distance-measuring area set by the control section.

13. The distance-measuring device according to claim 12, wherein the AF area sensor includes:

a pixel area in which photoelectric elements are arranged in a matrix, the photoelectric elements each receiving image for distance measurement formed by two photoelectric lenses located before the AF area sensor and having a parallax therebetween;

a horizontal/vertical control circuit operable under the control of the control section for scanning and outputting an amount of the image for distance measurement accumulated by the photoelectric elements included in the pixel area;

an output circuit for amplifying, by a predetermined level, a signal output from

the horizontal/vertical control circuit; and

a sensor control circuit operable under the control of the control section for controlling received-image accumulation and output operation of the AF area sensor,

the pixel area, the horizontal/vertical control circuit, the output circuit and the sensor control circuit being formed on a silicon substrate by a CMOS process.

14. The distance-measuring device according to claim 13, wherein the horizontal/vertical control circuit of the AF area sensor sequentially applies a sensitivity control signal to the photoelectric elements in units of one row of the matrix, thereby extracting an amount of image for distance measurement accumulated by those of photoelectric elements, which are located in each column of the matrix, extracting only a column at which the amount of image for distance measurement changes, detecting, simultaneously and in a parallel manner, pieces of outline data each corresponding to one scanning line, and outputting the detection result as the outline data.

15. A distance-measuring device capable of executing distance measurement at a plurality of points in a photography screen, comprising:

a sensor array formed of a plurality of photoelectric elements;

an A/D converter for converting outputs of the photoelectric elements into digital data, the A/D converter having a first A/D conversion mode in which conversion is executed at high speed and with low accuracy, and a second A/D conversion mode in which conversion is executed at low speed and with high accuracy;

outline judging means for subjecting outputs of the sensor array to A/D conversion executed in the first A/D conversion mode, thereby judging those portions of an outline of a subject, which exist at a plurality of points;

determination means for determining that one of the points, at which distance measurement is to be executed, on the basis of the judging result of the outline judging means; and

computing means for subjecting that one of the outputs of the sensor array, which corresponds to the point determined by the determination means, to A/D conversion executed in the second A/D conversion mode, thereby executing distance measurement on the basis of the conversion result.

16. A distance-measuring device capable of executing distance measurement at a plurality of points in a photography screen, comprising:

a sensor array formed of a plurality of photoelectric elements;



an A/D converter for converting outputs of the photoelectric elements into digital data;

outline judging means for judging those portions of an outline of a subject, which exist at a plurality of points in a photography screen, on the basis of a result obtained by a first A/D conversion operation of the A/D converter;

determination means for determining that one of the points, at which distance measurement is to be executed, on the basis of the judging result of the outline judging means; and

computing means for executing distance measurement at the point determined by the determination means on the basis of a result obtained by a second A/D conversion operation of the A/D converter, which is slower than the first A/D conversion operation.

17. The distance-measuring device according to claim 16, wherein the first A/D conversion operation is faster than the second A/D conversion operation, although the first A/D conversion operation is executed with a lower resolution than the second A/D conversion operation.

18. A distance-measuring device capable of executing distance measurement at a plurality of points in a photography screen, comprising:

a sensor for detecting an image of a subject;  
an A/D converter for converting an output of

the sensor into digital data, the A/D converter having first and second A/D conversion modes of different processing speeds and resolutions; and

5 a computing control circuit connected to the A/D converter and including:

a) a determination section for determining a characterizing point, included in a plurality of points in the photography screen, on the basis of an output of the A/D converter;

10 b) a distance-measuring section for executing distance measurement in each point in the photography screen on the basis of the output of the A/D converter; and

15 c) a switch control section for switching a conversion mode used in the A/D converter when operating the determination section and when operating the distance-measuring section.

19. The distance-measuring device according to claim 18, wherein preference is given to processing speed over resolution in the first A/D conversion mode, and to resolution over processing speed in the second A/D conversion mode.

20. The distance-measuring device according to claim 18, wherein the switch control section selects the first A/D conversion mode in which preference is given to processing speed over resolution, when the determination section executes a determining operation,

and selects the second A/D conversion mode in which preference is given to resolution over processing speed, when the distance-measuring section executed a distance measurement operation.

5           21. A distance-measuring device capable of executing distance measurement at a plurality of points in a photography screen, comprising:

          a sensor array formed of a plurality of detection pixels;

10           judgment means for reading an output of the sensor array with a rough pitch and judging, on the basis of the reading result, an outline of a subject that exists at the plurality of points in the photography screen;

          determination means for determining a distance-measuring point from the plurality of points on the basis of the judgment result; and

          computing means for reading an output of the sensor array with a fine pitch at the distance-measuring point determined by the determination means, thereby executing distance measurement based on the reading result.

          22. A distance-measuring device capable of executing distance measurement at a plurality of points in a photography screen, comprising:

25           a sensor array formed of a plurality of detection pixels;

          determination means for determining a charactering

point of an image formed at the plurality of points;

distance-measuring means for executing distance measurement at the plurality of points; and

switch means for switching local resolution of the sensor array when operating the determining means in a sequence of distance measurement, and when operating the distance-measuring means.

23. The distance-measuring device according to claim 22, wherein the switch means switches the local resolution of the sensor array by summation or nullification of output values of adjacent pixels of the sensor array.

24. A camera having a distance-measuring device, comprising:

first brightness distribution determining means for determining a brightness distribution in a photography screen;

area detecting means for detecting an area of a subject, existing in the photography screen, on the basis of the brightness distribution determined by the first brightness distribution determining means;

second brightness distribution determining means for determining a brightness distribution of the area of the subject determined by the area detecting means; and

distance-measuring means for executing distance measurement for the subject on the basis of the

brightness distribution determined by the second  
brightness distribution determining means.

25. The camera according to claim 24, wherein the  
first and second brightness distribution determining  
5 means have a common image pick upping surface.

26. A distance-measuring device capable of  
executing distance measurement at a plurality of points  
in a photography screen, comprising:

a sensor array having pixel rows, a detection  
10 pixel pitch of the sensor array being able to be  
switched between at least fine and rough pitches;

specifying means for setting the detection pixel  
pitch of the sensor array at the rough pitch to  
determine an outline of an image existing in a  
15 detection field of the sensor array so as to specify  
an object, a distance to which should be measured; and

means for setting the detection pixel pitch of  
the sensor array at the fine pitch to determine the  
distance to the object specified by the specifying  
20 means.

27. The distance-measuring device according to  
claim 26, wherein the detection pixel pitch of the  
sensor array is set by summing signals output from  
adjacent pixels or by pixel skipping.

28. A distance-measuring device capable of  
25 executing distance measurement at a plurality of points  
in a photography screen, comprising:

a sensor array having pixel rows, the sensor array being able to be switched between a linear mode in which an output value thereof is proportional to an amount of incident light, and a compression output mode  
5 in which the output value is a logarithmic compression value of the amount of incident light;

specifying means for setting the sensor array in the compression output mode to determine an outline of an image existing at the plurality of detection points  
10 in the photography screen so as to specify an object, a distance to which should be measured; and

means for setting the sensor array in the linear mode to determine the distance to the object specified by the specifying means.